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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,124	03/05/2002	David Crocker	U 013897-6	5132
140	7590	12/16/2005	EXAMINER	
LADAS & PARRY 26 WEST 61ST STREET NEW YORK, NY 10023			NAHAR, QAMRUN	
			ART UNIT	PAPER NUMBER
			2191	

DATE MAILED: 12/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/091,124	Applicant(s) CROCKER, DAVID	
	Examiner Qamrun Nahar	Art Unit 2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 02 September 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 11-20 is/are rejected.
- 7) ☒ Claim(s) 8-10 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 May 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### **DETAILED ACTION**

1. This action is in response to the amendment filed on 9/2/05.
2. The objection to the oath/declaration is withdrawn in view of applicant's submission of oath/declaration on 5/23/05.
3. The objection to the drawings is withdrawn in view of applicant's submission of replacement sheet on 5/23/05.
4. The objection to the disclosure is withdrawn in view of applicant's amendment.
5. The objections to claims 4, 8, 14 and 18 are withdrawn in view of applicant's amendment.
6. The rejection under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention to claims 1-10 is withdrawn in view of applicant's amendment.
7. Claims 1, 4, 8, 11, 14 and 18 have been amended.
8. Claims 1-20 are pending.
9. Claim 18 stand finally objected to because of informalities.
10. Claims 11-20 stand finally rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
11. Claims 1-7 and 11-17 stand finally rejected under 35 U.S.C. 102(e) as being anticipated by Gupta (U.S. 6,343,375).

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12. Claims 8-10 stand finally objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. Claims 18-20 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

### *Drawings*

14. The drawings were received on 5/23/05. These drawings are acceptable.

### *Response to Amendment*

#### *Claim Objections*

15. Claim 18 is objected to because of the following informalities: "save" on line 14 of the claim should be "safe". Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

16. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

17. Claims 11-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

18. As previously indicated in the last Office Action (Mailed on 01/13/2005, par. 9), claim 11 recites the limitation "**the** value of the respective member" in line 11 of the claim. There is insufficient antecedent basis for this limitation in the claims. Therefore, this limitation is interpreted as "a value of the respective member".

Claims 12-20 are rejected for dependency upon rejected base claim 11 above.

19. As previously indicated in the last Office Action (Mailed on 01/13/2005, par. 10), claim 11 recite the limitation "**the** element of the variant" in line 13 of the claim. There is insufficient antecedent basis for this limitation in the claims. Therefore, this limitation is interpreted as "an element of the variant".

Claims 12-20 are rejected for dependency upon rejected base claim 11 above.

### ***Claim Rejections - 35 USC § 102***

20. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

21. Claims 1-7 and 11-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Gupta (U.S. 6,343,375).

**Per Claim 1 (Amended):**

The Gupta patent discloses:

- a process of validating that a computer program segment with more than one path therethrough is recursively bounded, the computer program segment comprising a recursive cycle or a loop (column 5, lines 55-67 to column 6, lines 1-4)
- a) assigning a variant ordered array to the cycle or loop wherein members of the array are expressions derived from functions of variables and/or parameters of the program and the member at each position in the array represents a path through the cycle or loop; b) defining a predetermined ordered array of corresponding elements of predetermined values (column 6, lines 5-31)
- c) creating a hypothesis for establishing that recursion through the path is bounded, said hypothesis indicating that a value of the respective member of the array is decreased when the corresponding path is traversed and respective values of the members at earlier positions in the array are unchanged; and that the value of an element of the variant ordered array is never less than the value of the corresponding element of the predetermined ordered array; and d) proving the hypothesis for each path through the program segment (column 10, lines 6-50; An unbounded array continuously allocates memory for the unbounded array. That is, memory is recursively allocated for an unbounded array. Since Gupta is verifying that the arrays are not out of bounds, then Gupta is verifying that the recursion for the array is bounded.).

**Per Claim 2:**

The Gupta patent discloses:

- wherein the program segment is a method of an object oriented program (column 9, lines 59-67).

**Per Claim 3:**

The Gupta patent discloses:

- wherein the computer program segment is a loop which may perform any of a plurality of actions dependant on prevailing program conditions, and step a) of assigning a variant ordered array comprises assigning a member of the array to each action such that the value of the member decreases when the corresponding action is performed, and steps c) and d) of creating and proving a hypothesis comprise finding an order of the members of the array such that each action does not change the value of the members of the ordered array preceding the member corresponding to that action (column 10, lines 6-37).

**Per Claim 4 (Amended):**

The Gupta patent discloses:

- wherein the program segment is an isolated recursive cycle that does not intersect with any other cycle, wherein the cycle can call itself in more than one way, and step a) of assigning a variant ordered array comprises assigning a member of the array for each way in which the cycle can call itself, and steps c) and d) of creating and proving a hypothesis comprise finding an order of the members of the array such that way of calling itself does not change the value of the members of the ordered array preceding the member corresponding to that way of calling itself (column 12, lines 1-43).

**Per Claim 5:**

The Gupta patent discloses:

- wherein the program segment comprises intersecting recursive cycles that intersect solely at a single point and wherein step a) of assigning a variant ordered array comprises assigning a variant ordered array to the point where the recursive cycles intersect, wherein members of the array represent each of the intersecting cycles respectively (column 6, lines 32-55).

**Per Claim 6:**

The Gupta patent discloses:

- wherein the program segment comprises recursive cycles that intersect with each other at a first plurality of points, wherein step a) of assigning a variant ordered array comprises



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assigning a variant ordered array to each intersecting cycle such that each variant has at least a second plurality of members and corresponding members of the second plurality of members of each variant are of the same type so that the values thereof may be compared and step c) of creating a hypothesis comprises creating a hypothesis that for any path from a first point with a variant to the same point or to a second point with a variant, not passing through a third point with a third variant, the value of the corresponding member of the variant decreases and all preceding members of the arrays remain unchanged (column 24, lines 15-50).

**Per Claim 7:**

The Gupta patent discloses:

- wherein each of the variant arrays for the program segment has an equal number of members (column 24, lines 15-50).

**Per Claims 11 (Amended), 12-13, 14 (Amended) & 15-17 (as best understood):**

These are system versions of the claimed process discussed above (claims 1-7, respectively), wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Gupta.

***Allowable Subject Matter***

22. Claims 8-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

23. Claims 18-20 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

***Response to Arguments***

24. Applicant's arguments filed on 9/2/05 have been fully considered but they are not persuasive.

*In the remarks, the applicant argues that:*

a) Turning now from the Gupta citation, US 6,343,375, it will be noted from e.g. claim 1 thereof that this prior art teaching is concerned with preventing array references out of the bounds of the array and identifying each array reference which refers to an address not within the bounds of the array as an invalid reference. Thus the arrays disclosed in Gupta are part of the program being analysed whereas the arrays of the present invention as claimed are populated with "expressions derived from functions of variables and/or para[a]meters of the program and the member at each position in the array represents a path through the cycle or loop" (see subparagraph 2) of claims 1 and 11 and are thus a feature of the analysing system and method. They are used to establish bounded recursion (i.e. to eliminate unbounded or infinite recursion which

would cause the program to crash in use). Thus the parameter which is "bounded" in the process and system of the present invention is the number of recursions whereas the "bounds" referred to in Gupta are array addresses outside the bounds of the (pre-existing) array in the program being tested.

Specifically, the Examiner maintains that claim 1 is anticipated by column 5 line 55 to column 6 line 4, column 6 lines 5 to 31 and column 10 lines 6 to 50. However the first of these passages discloses how array reference tests should be handled in the presence of loops. The Gupta patent uses the word "recursively" to describe how the method (the program analyser) should handle nested loops. Conversely the recursion referred to in the present invention as claimed is present in the program itself and is the subject rather than the tool of the analysis provided by the claimed process and system.

The passage at page 6 lines 5 to 31 is concerned with detecting violation of array references (see line 18) by loops running in the program and is not concerned with establishing whether "recursion through the path is bounded", still less by means of the creation of the hypothesis involving changes in value of members of an array when the corresponding path is traversed as specified in sub-paragraph c) of claims 1 and 11.

Similarly, the passage at column 10 lines 6 to 50 is concerned with array violations and not with decreases in the values of array members when a path is traversed in connection with detection of infinite recursion.

In view of the clear distinctions between claims 1 and 11 and the Gupta citation, it is submitted that the remaining objections to the dependent claims are moot.

*Examiner's response:*

a) Examiner strongly disagrees with applicant's assertion that Gupta fails to disclose the claimed limitations recited in claims 1 and 11. Gupta clearly shows each and every limitation in claims 1 and 11.

Gupta teaches creating a hypothesis for establishing that recursion through the path is bounded, said hypothesis indicating that a value of the respective member of the array is decreased when the corresponding path is traversed and respective values of the members at earlier positions in the array are unchanged; and that the value of an element of the variant ordered array is never less than the value of the corresponding element of the predetermined ordered array; and d) proving the hypothesis for each path through the program segment (column 10, lines 6-50; An unbounded array continuously allocates memory for the unbounded array. That is, memory is recursively allocated for an unbounded array. Since Gupta is verifying that the arrays are not out of bounds, then Gupta is verifying that the recursion for the array is bounded.).

In addition, see the rejection above in paragraph 21 for rejection to claims 1-7 and 11-17.

*Conclusion*

25. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

26. Any inquiry concerning this communication from the examiner should be directed to Qamrun Nahar whose telephone number is (571) 272-3730. The examiner can normally be reached on Mondays through Fridays from 9:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Y Zhen, can be reached on (571) 272-3708. The fax phone number for the organization where this application or processing is assigned is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the TC 2100 Group receptionist whose telephone number is 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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QN



December 9, 2005



**WEI Y. ZHEN**  
**PRIMARY EXAMINER**